ACCIDENT

Aircraft Type and Registration:	1) Airbus A320-211, D-AIQA 2) Boeing 737-86N, EI-DKD
No & Type of Engines:	1) 2 CFM 56-5A1 turbofan engines 2) 2 CFM 56-7B26 turbofan engines
Year of Manufacture:	1) 1991 2) 2000
Date & Time (UTC):	5 August 2008 at 1223 hrs
Location:	Taxiway Juliet, Manchester Airport
Type of Flight:	1) Commercial Air Transport (Passenger) 2) Commercial Air Transport (Passenger)
Persons on Board:	1) Crew - 5 Passengers - 107 2) Crew - 6 Passengers - 180
Injuries:	1) Crew - None Passengers - None 2) Crew - None Passengers - None
Nature of Damage:	1) Right elevator and tail of the fuselage damaged 2) Right winglet damaged
Commander's Licence:	1) Airline Transport Pilot's Licence 2) Airline Transport Pilot's Licence
Commander's Age:	1) 42 years 2) 34 years
Commander's Flying Experience:	1) 10,820 hours (of which 7,912 were on type) Last 90 days - 128 hours Last 28 days - 54 hours 2) 4,652 hours (of which 3,483 were on type) Last 90 days - 257 hours Last 28 days - 82 hours
Information Source:	AAIB Field Investigation

Synopsis

An Airbus A320 had turned right off the main taxiway onto a link taxiway and stopped short of the runway prior to an intersection takeoff. It stopped 24.2 m short of the stop bar with its tail extending into the main taxiway. A following Boeing 737 was cleared to the holding point at the beginning of the runway, beyond the position where the A320 had stopped. That involved taxiing behind the A320, with an instruction to give way to the Airbus. The crew of the 737 believed that a clearance to the end of the taxiway meant that there were no obstacles to affect their aircraft. They also considered that there was sufficient clearance between their aircraft and the tail of the A320. As the 737 passed behind the A320, its right winglet struck the tail of the A320. Both aircraft were damaged.

History of the flights

Airbus A320, D-AIQA

D-AIQA pushed back from its stand at 1211 hrs, for a flight from Manchester to Frankfurt, and taxied towards Runway 23R via Taxiway Juliet (J). The crew requested Holding Point J1 (see Figure 1), so that they could use the full length of the runway, but were told by the Aerodrome Controller (ADC) that it would lead to a delay in their departure as another aircraft was already holding at J1. Instead, the ADC cleared the aircraft to hold at Holding Point JA1, the last taxiway link to the runway before J1. The commander, who was the handling pilot (PF), stopped the aircraft at JA1 and applied the parking brake. The nosewheel was later measured to be 24.2 m short of the stop bar. He subsequently stated that he was able to see the left side of the stop bar but not the right. Although he could have moved forward "a little" if asked to by ATC, he assessed that he had stopped in a reasonable position relative to the holding point.

At 1222 hrs, while holding for departure, the crew heard the ADC warn the crew of a Boeing 737, EI-DKD, that wingtip clearance was not assured. Almost immediately after the transmission they felt the aircraft "shaking around" and realised that there had been a collision.

The ADC instructed the crew of D-AIQA to "HOLD POSITION, AN AIRCRAFT BEHIND HAS CLIPPED YOUR AIRCRAFT FROM BEHIND" adding that fire vehicles were on their way. He subsequently told the crew that EI-DKD's winglet had detached in the collision but that no damage was observed on their aircraft and advised them to contact the fire vehicle crews. At 1229 hrs, the senior fire officer asked the crew to shut the engines down, which they did. The commander asked for permission to start the APU, which had been off at the time of the impact in preparation for departure. This was granted, after the senior fire officer had assessed the external damage to the tail of the aircraft.

The passengers subsequently disembarked the aircraft by steps positioned at the front left door and were taken back to the terminal by coach. There were no injuries.

Figure 1

(since this photograph was taken, the runway has been redesignated as Runway 23R)

Boeing 737, EI-DKD

EI-DKD was scheduled for a flight from Manchester to Tenerife. The aircraft pushed back from its stand at 1207 hrs and taxied via Taxiway J towards Holding Point J1 for Runway 23R. The commander was PF. When the crew changed to the Tower frequency, the ADC issued the clearance "GIVE WAY TO THE AIRBUS [D-AIQA] HOLDING ON THE RIGHT THEN HOLD J1". The crew read back "GIVE WAY TO THE AIRBUS AND HOLD SHORT J1". The commander stated later that he believed that a clearance to J1 meant that there were no obstacles to prevent him from taxiing that far. He also considered that the use of the phrase 'give way' had caused him some confusion, although he had not asked for clarification.

As EI-DKD was approaching JA1, the commander taxied the aircraft about 1.5 m left of the taxiway centreline, to increase its separation from D-AIQA, and continued to taxi slowly. He asked the co-pilot about the separation and was advised that, "with the aircraft moving left, it was ok". The crew thought that D-AIQA had increased power to move forward, as they approached, because they "saw ripples in puddles caused by the jet wash". The commander asked the co-pilot to apply some right aileron to stop the wing lifting as they passed behind D-AIQA's engines. Shortly after that the ADC advised the crew "GIVE WAY TO THE AIRBUS ON YOUR RIGHT, THE WINGTIP CLEARANCE IS UNDETERMINED". One second later, EI-DKD's right winglet struck the underside of D-AIQA's tail. The ADC instructed the crew of EI-DKD to hold position and subsequently told them that they should contact the fire crew. At 1227 hrs, the ADC instructed the crew to shut down their engines.

The passengers subsequently disembarked the aircraft from steps at the front left door and were taken back to the terminal by coach. There were no injuries.

Aerodrome controller

Manchester Airport was operating from a single runway as was usual for the time of day. The ADC was holding aircraft at both J1 and JA1 as it helped to increase runway utilisation. He believed that, by issuing an instruction for EI-DKD to 'give way' to D-AIQA, he had warned the crew to be careful. His expectation was that the crew of EI-DKD would not proceed past D-AIQA unless it was safe to do so. The view of the accident site from the Visual Control Room (VCR) was unobstructed. However, the distance and angle of the view made it difficult to assess the clearance between the aircraft and, although the ADC did pass a further warning prior to the collision, he was too late to stop it from happening.

Flight data recorder information

For most of the 20 seconds before the accident, EI-DKD's heading was constant at 055º ± ½º but it decreased to 054º two seconds before the collision. Right aileron was applied 16 seconds before the impact. The groundspeed 20 seconds before the collision was 13 kt and it decreased slowly until PF applied the brakes with eight seconds to go. The aircraft slowed to 4 kt, which it maintained for the remaining five seconds before the collision.

The collision caused the nose to swing right to 056º after which the heading decreased to 050º over four seconds. The speed decreased to 3 kt for five seconds before the aircraft was brought to a halt over two seconds.

Cockpit voice recorder

The CVR from EI-DKD was translated by a member of the accident investigation authority from the state of the operator.

In the 30 seconds before the collision, the crew of EI-DKD were doubtful about the clearance between

their wingtip and D-AIQA's tail and the commander asked the co-pilot to confirm that there was sufficient room. Without waiting for an answer, he asked the co-pilot to maintain the position of the control wheel, to which the co-pilot answered "YES". This was when right aileron was applied. Next, in answer to the question about clearance, the co-pilot said "YES, I THINK THERE IS BUT…..I DON'T KNOW….PERHAPS….YES…..I CAN'T SAY". The last phrase could also be translated as "I'm not able to say" or "I don't know". The commander seemed to want a more definitive answer and, again, sought confirmation. After a short while the co-pilot decided that there probably was sufficient clearance. Although it was clear from his tone he was not absolutely certain, he seemed to have fewer doubts than before. Finally, he said: "YES, WE CAN PASS. YES. YES".

In discussions on the flight deck following the accident, the commander said he had not understood properly his clearance in relation to D-AIQA. He thought D-AIQA was going to move forward for takeoff before his aircraft passed behind it, because his clearance had been to "give way" to D-AIQA. If that was not the case, he thought his clearance should have been to "hold position".

Damage

The top 1.5 m of EI-DKD's right winglet had detached. It fell to the ground and was blown to the edge of the taxiway by the jet wash of D-AIQA.

On D-AIQA, the right elevator was bent and ripped and there was a 50 x 50 mm hole in the unpressurised section of the tail. The APU access panel was bent and the tail cone skin and structure near the access panel was deformed. There was also some scratching to the lower skin of the left stabiliser.

Procedures

The Rules of the Air Regulations regarding right of way on the ground, as contained in Civil Aviation Publication (CAP) 393, entitled *AIR NAVIGATION: THE ORDER AND THE REGULATIONS,* Rule 37(2)[1] stated:

> *'notwithstanding any air traffic control clearance it shall remain the duty of the commander of an aircraft to take all possible measures to ensure that his aircraft does not collide with any other aircraft'*

CAP 637, the *Visual Aids Handbook*, states that when reaching the taxi clearance limit the pilot should:

> *'stop the aircraft as close as possible to the taxi-hold position.'*

It also states:

> *'Taxi Holding Positions are normally located so as to ensure clearance between an aircraft holding and any aircraft passing in **front** of the holding aircraft, provided that the holding aircraft is properly positioned **behind** the holding position. **Clearance to the rear of any holding aircraft cannot be guaranteed.** When following a taxiway route, pilots and persons towing an aircraft are expected to keep a good lookout and are responsible for taking all possible measures to avoid collisions with other aircraft and vehicles.'*

The UK Aeronautical Information Publication (AIP) contains remarks for Manchester Airport which state:

Footnote

[1] Since the event this Rule has been amended and re-numbered.

> *'pilots are reminded of the need to exercise caution on wingtip clearances from other aircraft when manoeuvring in close proximity on the ground. Particular care should be taken in the runway holding areas and at runway crossing points.'*

CAP 493, the *Manual of Air Traffic Services* (MATS) - *Part 1*, contains statements on the responsibility of controllers and states:

> *'aerodrome control is responsible for issuing information.....to assist pilots in preventing collisions between.....aircraft and other aircraft on the manoeuvring area.'*

Controllers often discharge this responsibility by issuing pilots with instructions to follow, or give way to, another aircraft or by giving conditional clearances that begin with, for example, 'after the (aircraft type) crossing from left to right.....'.

CAP 168, *Licensing of Aerodromes*, includes instructions on the design of taxiways to ensure the largest aircraft to use a taxiway has clearance from fixed obstacles. No such provision is made in respect of clearance from other aircraft.

Analysis

Because it is difficult for pilots to assess accurately when the nose of their aircraft has reached a holding point, they regularly err on the side of caution by stopping slightly before the holding point. In this case, D-AIQA's (the A320) nosewheel stopped 24.2 m short of JA1's stop bar.

The crew of the Boeing 737, EI-DKD, had doubts about the meaning of their ATC clearance to Holding Point J1 and about the separation between their aircraft and D-AIQA. The commander's understanding was that he would not have been cleared to J1 unless wingtip clearance was assured - an understanding contrary to the warning in the UK AIP - and the instruction to 'give way' to D-AIQA caused some confusion in his mind. However, in making the decision to continue, the commander was also considering other information. He thought that D-AIQA was going to move forward, otherwise he surmised that he would have been instructed to 'hold position'. This view was reinforced when he saw ripples on puddles of water behind D-AIQA's engines, leading him to think that power had been increased, and the co-pilot confirmed that the wingtip was clear.

The ADC's expectation was that the crew of EI-DKD would not proceed unless safe to do so. Also, the distance and aspect of the ADC's view from the VCR made it difficult for him to intervene early enough to prevent the collision.

Follow-up action

Previously, a similar accident occurred at Manchester Airport in February 2007, at the same position on the aerodrome manoeuvring surface. Following the second event, as described in this report, the authorities at Manchester Airport, in conjunction with ATC, conducted a review of the local procedures and introduced the following changes:

1. The Ground Movement Controller would only clear an aircraft to the intermediate position at J4, the holding position on the taxiway prior to the holding position at JA1.

2. The Air Controller would give clearance beyond J4 but only when there were no

aircraft positioned at the intermediate holding position at JA1.

3. The use by ATC of the phrase 'give way' was withdrawn.

The airport authority reported that, since their introduction, these changes have proved effective.

Note: A report on the accident involving a Boeing 777, AP-BGY, and a DHC-8, G-JEDR, which occurred at Manchester Airport in February 2007, is also published in this Bulletin.